Computer Basics

Computer Memories

Computer Memories

The purpose of memory

- You have documents and applications stored on the hard drive.
- When you want to work on these documents, you open them and place them in the computer's work area.
- The work area (or desk space) for a computer is system memory.
- When you want to work with any application or document, the computer must retrieve that information from the hard drive and execute it from memory.

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Read-only memory (ROM)

- Read-only memory. Information is written to ROM chips by the manufacturer, and this information cannot be changed.
- In the past, if ROM information needed to be updated, you had to remove the original ROM chip and replace it with an updated ROM chip from the manufacturer.
- Today, you can update the ROM by running a special software program downloaded from the manufacturer's website.

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Read-only memory (ROM)

- One of the major uses for ROM is storing the system BIOS (basic input-output system), which contains the Power-on Self-Test (POST) routines and other routines that initiate loading the OS.
- The BIOS also contains the low-level code that allows the system to communicate with hardware devices.

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EPROM

- EPROM (erasable programmable ROM) is a type of memory that normally cannot be written to because it is a variation of ROM. An EPROM chip is a special ROM chip that the manufacturer can reprogram by using a special programming device that uses ultraviolet light.

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EEPROM

- A newer implementation of ROM is electrically erasable programmable ROM (EEPROM), or flash ROM.
- The manufacturer writes the software instructions into the ROM chip, but you can update these instructions by running a special software setup program provided by the manufacturer.
- The software setup program is usually available through the manufacturer’s website.

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Random access memory (RAM)

- ROM is permanent memory, or permanent storage of information. As the computer's primary working memory.
- RAM stores information temporarily. RAM is volatile, meaning that it needs constant electrical current to maintain the information that resides in its chips. If the electrical current is lost, RAM contents are erased.
- Likewise, when a computer is powered off, all RAM contents are flushed out.

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DRAM

- Dynamic RAM (DRAM) is probably the most popular type of memory today and the one that you are most often going to upgrade.
- Dynamic RAM gets its name from the fact that the information stored in DRAM needs to be constantly refreshed.
- Refreshing involves reading the bits of data stored in DRAM and then rewriting the same information back.
- DRAM is single-ported: You can read and write to the memory but not at the same time.

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DRAM

- Older implementations of RAM measured the memory's performance based on how long it took the CPU to access that data.
- This time is measured in nano-seconds (ns; 1 ns equals one-billionth of a second).
- If you have memory that is 50 ns and your friend has memory that is 70 ns, your memory is presumably faster.
- Your CPU receives the information from memory after waiting only 50-billionths of a second, whereas your friend's CPU waits 70-billionths of a second.

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DRAM

- The lower the number of nanoseconds, the better the performance
- The speed of older DRAM ranges from 60 ns to 80 ns.
- Today’s implementations of DRAM measure the speed of memory in megahertz (MHz), typically matching the motherboard speed.

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SRAM

- Static RAM (SRAM) — so-called because the information held in its memory cells doesn't need to be refreshed — requires less overhead than DRAM to maintain the information stored in memory.
- With speeds running from 10 ns to 20 ns, SRAM is much faster than DRAM.
- Because SRAM is faster memory than DRAM, it is also more expensive, which is why people add DRAM to their systems more often than they add SRAM.

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SRAM

- SRAM is typically used for cache memory, which stores frequently used data and program code after it is read from slower DRAM.
- Think of cache memory as a bucket that sits beside the CPU and stores frequently used information. After the system has searched through DRAM once for specific information, it can store that information in the bucket for easy access later.
- The next time the data is requested, it is read from cache instead of from system memory.

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SRAM

- Because cache memory is much faster than DRAM, the CPU first tries to retrieve the information from cache: specifically, L1 cache first and then L2 cache.
- If the information is not located in cache, the system then tries to retrieve the information from memory.
- If the information is not located in system memory, it then is retrieved from disk.
- Attempting to retrieve the requested information from cache first reduces wait time if the information actually resides there because of how fast cache is compared with DRAM.

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CMOS RAM

- The complementary metal-oxide semiconductor (CMOS) is the area where the computer stores its configuration information, such as whether the computer has a floppy drive, the amount of memory installed, the date and time for the system, and the number and size of the hard drives that are installed.

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CMOS RAM

- Where is CMOS information stored? Is CMOS information stored on the BIOS chip, or perhaps another ROM chip?
- if the information were stored on a ROM chip, you wouldn't be able to go into the CMOS setup program and change the configuration. Instead, CMOS configuration information is stored in a type of RAM called CMOS RAM.
- CMOS RAM is a special, volatile RAM chip that stores the CMOS information. If power is lost, the information is wiped out. To prevent this problem, computers have a small battery on their motherboards that maintains enough of a charge to prevent CMOS RAM from losing its data.

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VRAM

- Video RAM (VRAM) is most commonly used on video accelerator cards to store values of pixels on screen for refresh purposes.
- VRAM is the favored memory for video because it outperforms the other memory types because it is dual-ported memory: That is, it can be read from and written to at the same time. Comparatively, DRAM is single-ported, which means that the memory can be written to and read from, but not simultaneously — only one direction at a time. VRAM, however, allows you to do both simultaneously.

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VRAM

- Video graphics cards today help relieve stress from the CPU because they have their own processor, a graphics processing unit (GPU) to handle the mathematical calculations related to graphics operations.
- These graphics cards also contain a large block of memory as well. Many graphics cards will contain video memory in the gigabytes with 2GB of VRAM not being enough to handle high-end games at high resolutions.
- Many gaming systems will require a video card with at least 4GB of VRAM to handle the high resolution of high-end games.

Thanks For Attention